



SHORT LAKE CLASSIFICATION REPORT ON DEEP LAKE ADAMS COUNTY, WI

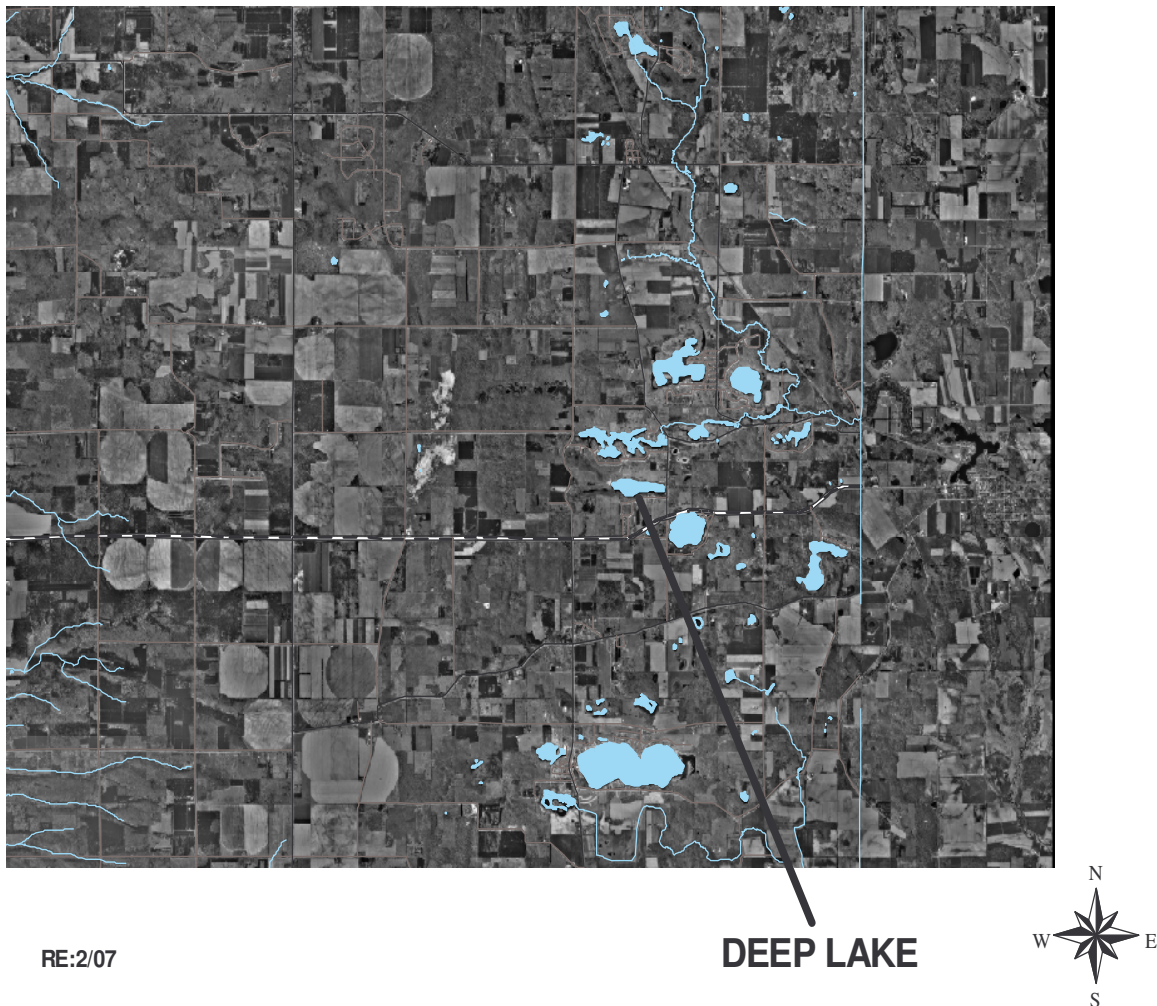
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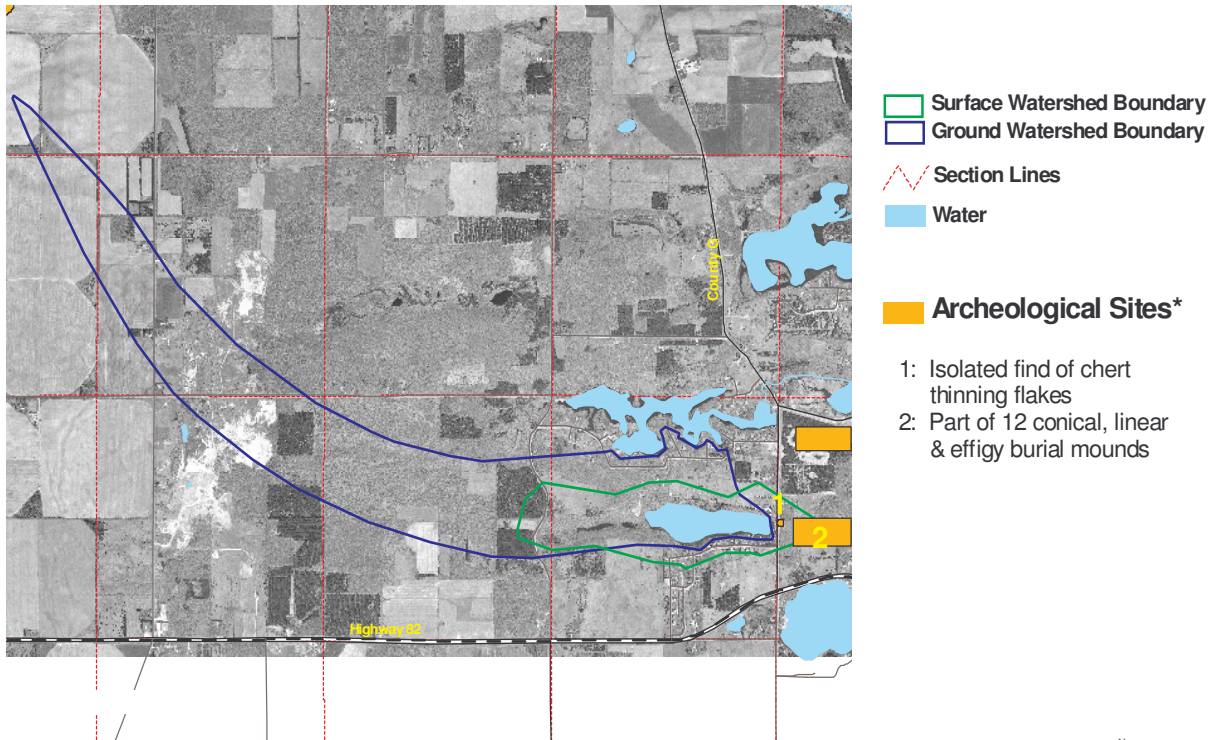
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Introduction

Information about Deep Lake: Deep Lake is located in the Town of Jackson, Adams County, WI, in the south central part of Wisconsin. Deep Lake is a mesotrophic seepage lake formed from historical glacier activity. It has good to very good water quality and clarity. It has 35 surface acres, with a maximum depth of 50 feet. It has an oval-shaped basin with a steeply-sloping littoral zone. As is the case with seepage lakes, the water level in Deep Lake fluctuates naturally in keeping with fluctuations in the underground water table. The only public access is a steep stairway “carry-in”. There is no public boat ramp, although in the past, the resort owner on the east end allowed access for a fee. That private ramp is now blocked off to the public. It is the only lake with public access in the county without any lake organization.



Deep Lake Archeological Sites



RE:4/05;revised 7/06

*information from Wisconsin Historical Society



Conical mound

There are many Native American archeological sites in Adams County, with two being located right around Deep Lake and shown on the map above. To preserve Native American heritage, state and federal law prohibit further disturbance of these sites without permission of the government and input from the local tribes.

Land Use

Both the surface and ground watersheds of Deep Lake are fairly small, although the ground watershed has a tail. Studies have shown that land use around a lake is the product of its watershed, with land use having a great impact on the water quality of that lake, especially in the amount and content of stormwater runoff from the surface. Runoff volume is affected by the amount of impervious surface, the soil type and the slope of the area. Natural landscapes tend to have low runoff rates.

Land use and percent of total in acres is shown on the chart below:

	Surface		Ground		Total	
Deep Lake	Acres	% Total	Acres	% Total	Acres	% Total
Agriculture--Non Irrigated	7.61	5.64%	31.38	4.36%	38.99	4.56%
Agriculture--Irrigated	0	0.00%	218.29	30.33%	218.29	25.54%
Government	0	0.00%	59.23	8.23%	59.23	6.93%
Grassland/Pasture	7.61	5.64%	10.72	1.49%	18.33	2.14%
Residential	19.81	14.68%	101.91	14.16%	121.72	14.24%
Water	35	25.93%	3.8	0.53%	38.8	4.54%
Woodland	64.93	48.11%	294.37	40.90%	359.3	42.05%
total	134.96	100.00%	719.7	100.00%	854.66	100.00%

Woodlands are the largest land use category in both Deep Lake watersheds, but only contribute the third most amount of phosphorus to Deep Lake waters (3.7%). Since forest floors are often full of leaves, needles and other duff, runoff from forested lands is may be more filtered than that from agricultural or residential lands.

Residential land use is the second largest land use in the surface watershed. Over half of it is concentrated around the lake itself. This land use category, in some instances, may contribute a significant amount of nutrients to the water from stormwater runoff, manicured lawns, and impervious surfaces.

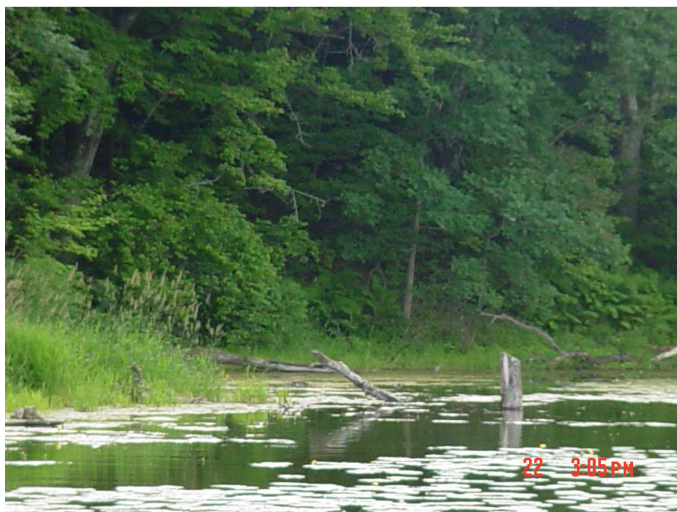
The second largest land use in the ground watershed is agriculture, both irrigated and non-irrigated. Traditionally, agriculture may also contribute substantially to the amount of nutrients in water.

There are only scattered wetlands in the Deep Lake watershed. Wetlands can play an important role in water quality by trapping many pollutants in runoff waters and by serving as buffers to catch and control what would otherwise be uncontrolled water and pollutants. Wetlands also play an essential role in the aquatic food chain, thus affecting fishery, and also serve as spaces for wildlife habitat, wildlife reproduction & nesting, and wildlife food.

Like many lakes in Wisconsin, Deep Lake is a phosphorus-limited lake, meaning that of the pollutants that end up in the lake, the one in the shortest supply and most affects the overall quality of the lake water is phosphorus. Land use types play a major role in determining the amount of phosphorus being loaded into the lake.

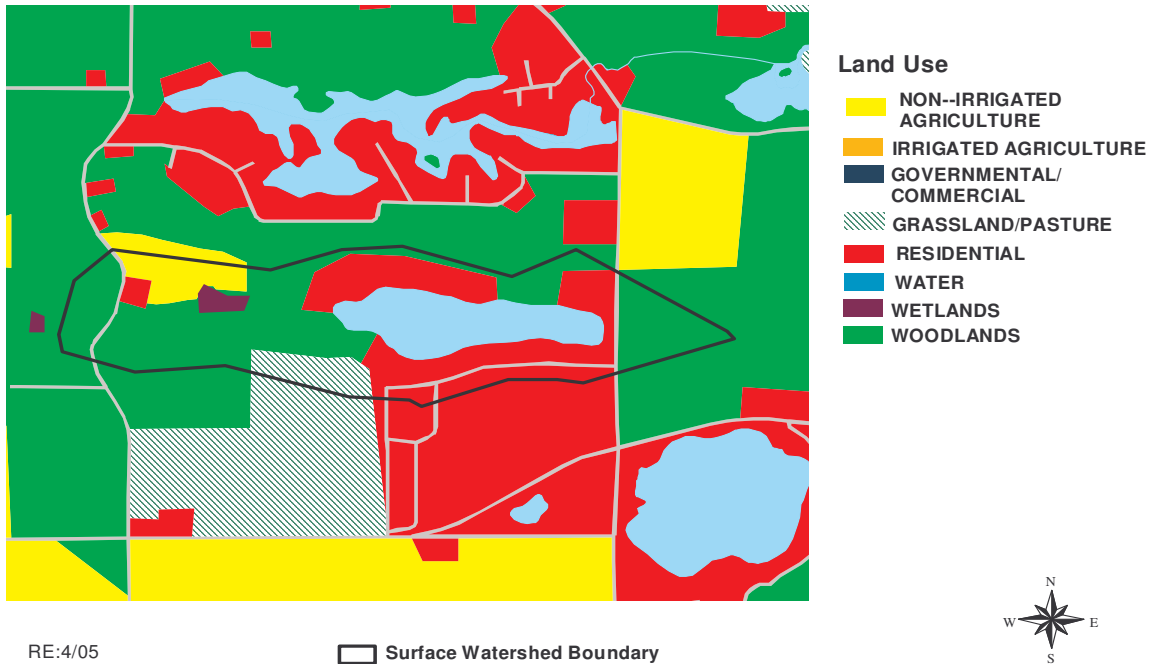
MOST LIKELY LOADING		Current
BY LAND USE	%	lb/yr
Agriculture--Non Irrigated	5.8%	6.60
Agriculture--Irrigated	23.2%	26.40
Grassland/Pasture	0.7%	0.50
Residential	7.9%	8.80
Woodlands	2.5%	2.20
Groundshed	27.6%	33.00
Lake Surface	4.0%	4.40
Septics	28.3%	32.87
Total in pounds/year	100.0%	114.77

Some aspects of phosphorus loading can't be modified by human behavior changes—they are simply part of the natural landscape. However, phosphorus loading from agriculture (irrigated or non-irrigated), residential and septic use of the land can be changed. Reducing the phosphorus loading from only the land use types directly impacted by human activities by 10% reduces the phosphorus load by 10.77 pounds/year. While that may not initially sound like a lot, one pound of phosphorus may result in 500 pounds of algae. Just a 10% reduction results in as much as 5385 pounds less of algae per year!

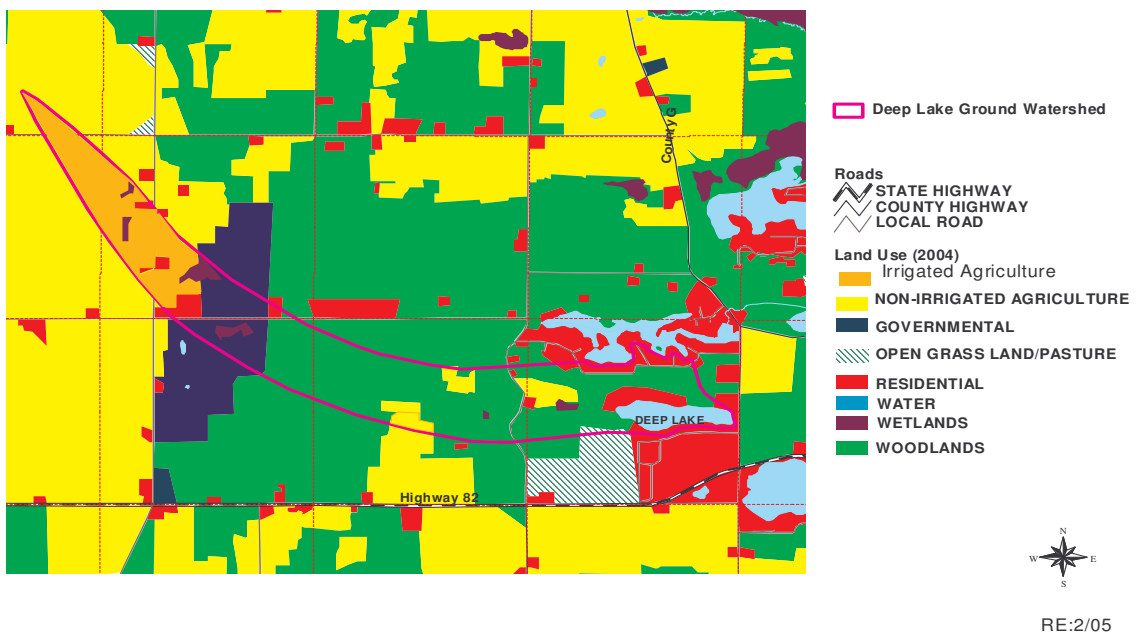


**Part of Deep
Lake's Shore**

Land Use--Deep Lake Surface Watershed



DEEP LAKE GROUND WATERSHED LAND USE



Shorelands

Deep Lake has a total shoreline of 1.28 miles (6758 feet). Most of the shore has been left unaltered so far, except for a small beach associated with a campground, a few grassy areas by docks, and the east end of the lake, where riprap covers the front of five small resort cottages. Most of the areas near the shore are steeply sloped, except at the far east end, where the land is flatter. Buildings are generally located 70 or more feet back from the shore. About 81% of Deep Lake's shoreline is vegetated with native vegetation.



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 ACTIVE EROSION
SEAWALL/ROCK
VEGETATED SHORE



However; a 2005 shore survey showed that more than 80% of the shore had an “adequate buffer.” An “adequate buffer” is a native vegetation strip at least 35 feet landward from the shore. However, some 16% of the shore had an “inadequate buffer”. Most of the “inadequate” buffer areas were those with hard structures, mowed lawns and/or insufficient native vegetation at the shoreline to cover 35 feet landward from the water line.

Buffers on Deep Lake

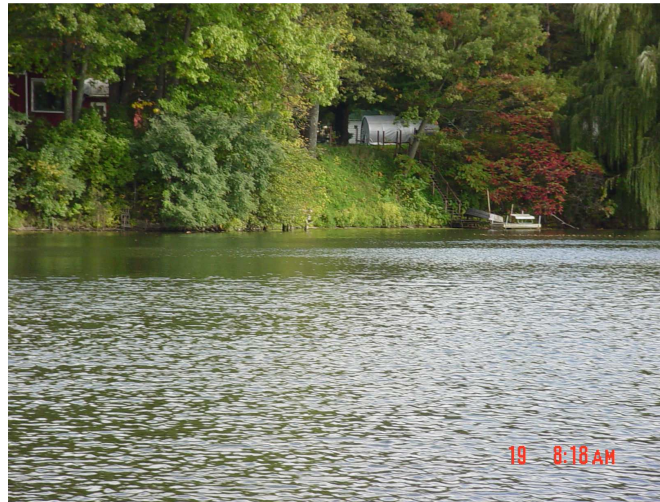


RE:4/05

 Adequate Buffer
 Inadequate Buffer



Shoreland buffers are an important part of lake protection and restoration. These buffers are simply a wide border of native plants, grasses, shrubs and trees that filter and trap soil & similar sediments, fertilizer, grass clippings, stormwater runoff and other potential pollutants, keeping them out of the lake. A 1990 study by the Wisconsin Department of Natural Resources of Wisconsin shorelines revealed that a buffer of native vegetation traps 5 to 18 times more volume of potential pollutants than does a developed, traditional lawn or hard-armored shore. The filtering process and bank stabilization that buffers provide help improve a lake's water quality, including water clarity.



Example of Adequate Buffer



Steep shore at Deep Lake



Example of Inadequate Buffer

Vegetated shoreland buffers help stabilize shoreline banks, thus reducing bank erosion. The plant roots give structure to the bank and also increase water infiltration and decrease runoff. A vegetated shore is especially important when shores are steep and sandy, as are many of the Deep Lake shores.

Water Quality Information

One of the measures Wisconsin uses to give a general estimate of a lake's water quality is the **trophic state index**. This index looks at a lake's water clarity, its amount of total phosphorus (the element most related to aquatic plant and algal growth), and its chlorophyll-a level (chlorophyll-a is a pigment used by algae for photosynthesis).

Depending on the trophic index score, lakes are then classified as **Oligotrophic** (good), **Mesotrophic** (fair) or **Eutrophic** (poor).

- **Good:** Oligotrophic lakes have clear, deep water with few algal blooms. Larger game fish are often found in such lakes.
- **Fair:** Mesotrophic lakes have more aquatic plant and algae production, with occasional algal blooms and a good fishery. The water is usually not as clear as that of oligotrophic lakes.
- **Poor:** Eutrophic lakes are very productive, with lots of aquatic plants and algae. Algal blooms are often frequent in these lakes. They may have a diverse fishery, but rough fish (such as carp) are also common. Water is often cloudy or murky. Small shallow lakes are more likely to be eutrophic.

Score	TSI Level Description
30-40	Oligotrophic: clear, deep water; possible oxygen depletion in lower depths; few aquatic plants or algal blooms; low in nutrients; large game fish usual fishery
40-50	Mesotrophic: moderately clear water; mixed fishery, esp. panfish; moderate aquatic plant growth and occasional algal blooms; may have low oxygen levels near bottom in summer
50-60	Mildly Eutrophic: decreased water clarity; anoxic near bottom; may have heavy algal bloom and plant growth; high in nutrients; shallow eutrophic lakes may have winterkill of fish; rough fish common
60-70	Eutrophic: dominated by blue-green algae; algae scums common; prolific aquatic plant growth; high nutrient levels; rough fish common; susceptible to oxygen depletion and winter fishkill
70-80	Hypereutrophic: heavy algal blooms through most of summer; dense aquatic plant growth; poor water clarity; high nutrient levels

Deep Lake's overall TSI is 43



Water clarity readings are usually taken by using a Secchi disk (shown at right). **Average summer Secchi disk clarity in Deep Lake in 2004-2006 was over 14 feet.** Deep Lake has consistently scored in the “very good” clarity category since 1992. Water clarity can be reduced by turbidity (suspended materials such as algae and silt) and dissolved organic chemicals that color or cloud the water.

Increased phosphorus levels in a lake will feed algal blooms and also may cause excess plant growth. **The 2004-2006 summer average phosphorus concentration in Deep Lake was 18.42 micrograms/liter.** This is below the 25 micrograms/liter average for natural lakes in Wisconsin. However, phosphorus levels at the bottom have increased since 1992, suggesting an accumulation of nutrients. With twice yearly turnovers, this means increased phosphorus in the water column..



The third measure used in trophic state classification is the amount of chlorophyll-a contained in the lake. The amount of chlorophyll-a found in a lake is an indication about the amount of algae in the lake. **The 2004-2006 summer average chlorophyll-a concentration in Deep Lake was 3.6 micrograms/liter.** This level of chlorophyll-a gives Deep Lake a “very good” ranking for chlorophyll-a (i.e., it’s very low). All chlorophyll-a readings for Deep Lake have been low.

In-Lake Habitat

Aquatic Plants

A diverse aquatic plant community plays a vital role in improving water quality, providing valuable habitat resources for fish and wildlife, resisting invasions of non-native species and checking excessive growth of the most tolerant species.

An aquatic plant survey was performed in 2005. The 0-1.5ft depth zone supported the most abundant aquatic plant growth. The Deep Lake aquatic plant community is characterized by good quality and average species diversity. *Chara* spp (muskgrass), *Ceratophyllum demersum* (coontail), *Potamogeton amplifolius* (large-leaf pondweed) and *Potamogeton zosteriformis* (flat-stemmed pondweed) were the most common aquatic species.

Important to maintaining a quality, diverse aquatic plant community is an integrated aquatic plant management plant that controls the invasive plants in the lake. Currently, none of the “big three” invasive aquatic plants are found at Deep Lake. However, it is surrounded by lakes, including several less than a mile from its shore, that have or have had significant problems with invasives, especially with Eurasian Watermilfoil. It is essential that Deep Lake be monitored in an attempt to prevent any such invasives from gaining hold there.

More detailed information can be found in the aquatic plant report of the 2005 survey, available on request from the WDNR or Adams County Land & Water Conservation Department.



Curly-Leaf Pondweed

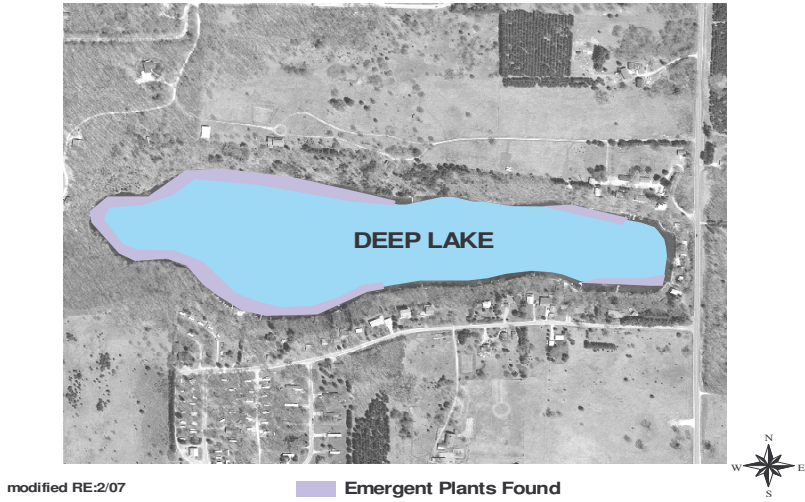


Purple Loosestrife

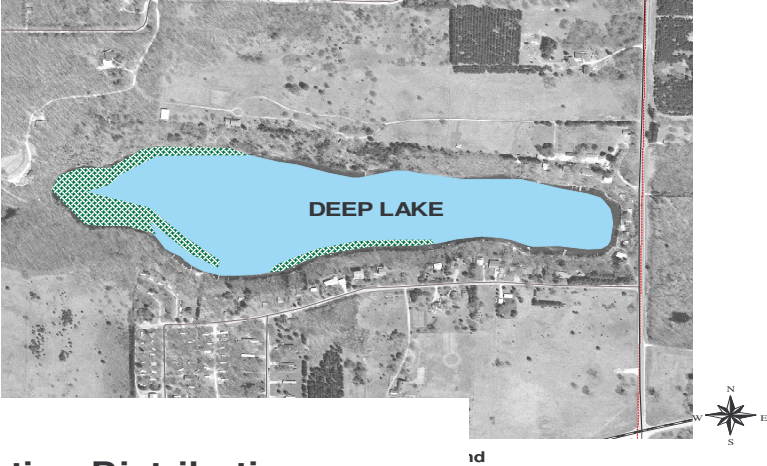


Eurasian Watermilfoil

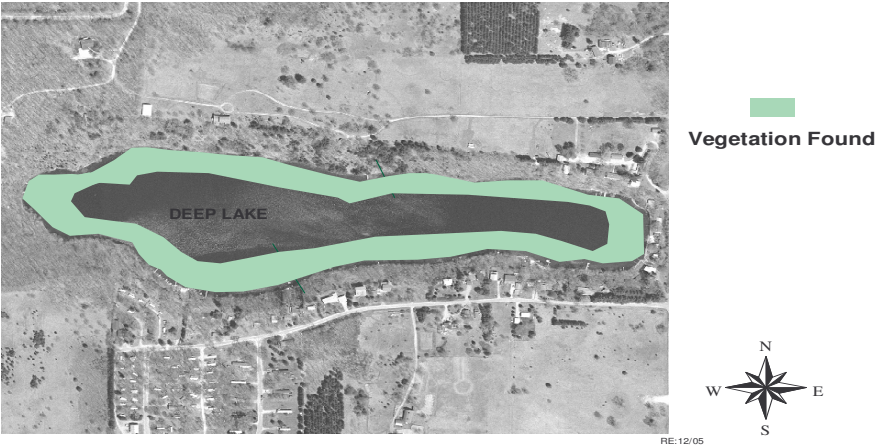
Emergent Plants in Deep Lake



Floating-Leaf Plants in Deep Lake

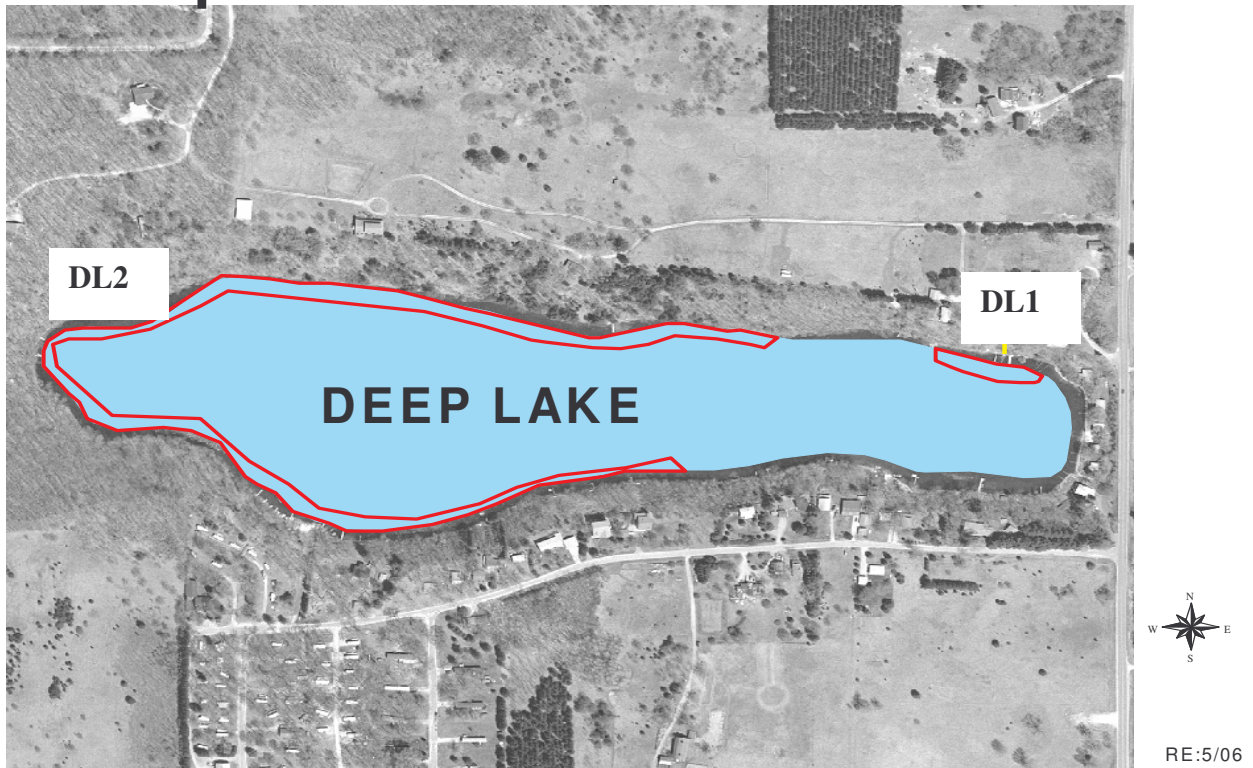


Deep Lake Submergent Vegetation Distribution



Critical Habitat

Deep Lake Critical Habitat Areas



Wisconsin Rule 107.05(3)(i)(I) defines a “critical habitat areas” as: “areas of aquatic vegetation identified by the department as offering critical or unique fish & wildlife habitat or offering water quality or erosion control benefits to the body of water. Thus, these sites are essential to support the wildlife and fish communities. They also provide mechanisms for protecting water quality within the lake, often containing high-quality plant beds. Finally, critical habitat areas often can provide the peace, serenity and beauty that draw many people to lakes in the first place.

The Critical Habitat Report for Deep Lake has more specific information on these sites. Copies are available from the Adams County Land & Water Conservation Department.

Two areas on Deep Lake were determined to be appropriate for critical habitat designation. DL1 extends along approximately 300 feet of the northeastern shoreline of Deep Lake, up to the ordinary high water mark. DL2 extends along approximately 4300 feet of the western shoreline.

Part of DL1



Part of DL2



Fishery/Wildlife/Endangered Resources

A 1948 fishery inventory of Deep Lake found that bluegills were abundant, black crappie & yellow perch were common, but other fish types were scarce. It described Deep Lake as “infertile, with moderate to scarce plankton, suitable for trout, moderate to sparse vegetation with little shallow area”. It noted that there was not heavy fishing pressure on Deep Lake.

Stocking records go back to 1942 when perch and largemouth bass were stocked. Bluegills and largemouth bass were stocked through the 1940s. In the 1960s and 1990s, brown and rainbow trout were stocked. Inventories from 1953 through 1979 noted that largemouth bass, rock bass, bluegills and other panfish were abundant or common. Northern pike tended to be scarce.

Muskrat and mink are also known to use Deep Lake shores for cover, reproduction and feeding. Seen during the field survey were various types of waterfowl, songbirds, and turkey. Frogs and salamanders are known, using the lake shores for shelter/cover, nesting and feeding. Turtles and snakes also use this area for cover or shelter in this area, as well as nested and fed in this area. A blue heron rookery is known at the west end of the lake. Upland wildlife feed and nest here as well.

Blue Heron Rookery

**(Not taken at Deep
Lake)**



Recommendations

Lake Management Organization & Plan

- By the end of 2008, Deep Lake residents should form a lake association to oversee the management of their lake. The Adams County Land & Water Conservation Department is available for assistance, if requested.
- Once a lake association has been formed, a lake management plan can be written. The Adams County Land & Water Conservation Department is available for assistance, if requested.
- Such a management plan needs to include at least the following aspects concerning the management of the lake: aquatic species management; control/management of invasive species; wildlife and fishery management; nutrient budgeting; shoreland protection; critical habitat protection; water quality protection.

Watershed Recommendations

- Since computer modeling results suggest that input of nutrients, especially phosphorus, are a factor that needs to be explored for Deep Lake, it is recommended that both the surface and ground watersheds be inventoried, documenting any of the following: runoff from any livestock operations that may be entering the surface water; soil erosion sites; agricultural producers not complying with nutrient management plans and/or irrigation water management plans.
- If such sites are documented, steps for dealing with these issues can be incorporated into the lake management plan.

Water Quality Recommendations

- All lake residents should practice best management on their lake properties, including keeping septic systems maintained in proper condition and pumped every three years, eliminating the use of lawn fertilizers, cleaning up pet wastes and not composting near the water.
- Reducing the amount of impervious surface around the lake and management of stormwater runoff will also help maintain water quality.
- Residents should get involved in the Citizen Lake Monitoring Programs, including water quality monitoring, invasive species monitoring & Clean Boats, Clean Waters.
- The natural shoreline at the end of Deep Lake should be restored as much as possible. This is especially important because the buildings are very close to the water, so runoff goes almost directly into the lake.

Aquatic Plant Recommendations

- All lake users should protect the aquatic plant community in Deep Lake by assisting in developing and implementing an integrated aquatic plant management plan.
- Monitoring for invasive plants needs to be ongoing and vigilant. Since Deep Lake currently has no exotic invasives (except Reed Canarygrass), it would be great to keep the lake that way.
- Reduce the presence of Reed Canarygrass to keep it from spreading.
- A milfoil weevil survey should be conducted on Deep Lake in order to evaluate milfoil weevil availability for assistance in controlling the Eurasian Watermilfoil should that become an issue.
- Lake residents should get involved in the county-sponsored Citizen Aquatic Invasive Species Monitoring Program. This will allow not only noting changes in the aquatic plant community, esp. involving invasives. Noting the presence and density of invasives early is the best way to take preventive action to keep them from becoming a bigger problem.

Critical Habitat Recommendations

- Maintain current habitat for fish and wildlife. No alteration of littoral zone except for WDNR-approved projects.
- Leave fallen trees along shoreline & in water and maintain snags for nesting.
- Limit clearing of the shore areas to the 30' per 100' allowed by law. Disturb these areas as little as possible.
- No installation of piers or other activity unless permitted by WDNR.
- Seasonal protection of spawning habitat and blue heron rookery.
- Maintain the wildlife corridor.
- Maintain sedge meadow/deep marshes areas.
- Protection emergent vegetation.
- Seasonal control of exotics, if such becomes necessary.
- No bank grading or grading of adjacent land.
- Maintain aquatic vegetation in undisturbed condition for wildlife habitat, fish use and water quality protection.
- Minimize development of shore & steep banks that would increase erosion and decrease water quality.